

Application No. 09/683,658
Reply to Office Action of March 2, 2006

121655-1

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-103 (cancelled)

Claim 104. (Currently amended) An apparatus, comprising:

a capsule having an interior surface defining a volume, and the capsule is configured to receive a material and a fluid in the capsule volume, the capsule both is scalable, and is operable to maintain a seal while the capsule is subject to a ~~predetermined~~ determined temperature and to a ~~predetermined~~ determined pressure, and the fluid is operable to become supercritical at least at the ~~predetermined~~ determined temperature and the ~~predetermined~~ determined pressure;

a restraint having an interior surface defining a chamber, and the chamber is configured to receive the capsule, and the restraint is responsive to resist a pressure exerted by the capsule against the restraint interior surface and to maintain the chamber at a substantially constant volume; and

an energy source operable to supply sufficient thermal energy to the capsule so that the determined temperature is at least about 800 degrees Celsius, wherein the fluid is responsive to the thermal energy both to become supercritical at the ~~predetermined~~ determined temperature and at the substantially constant volume in the chamber, and to increase the pressure in the volume to at least the ~~predetermined~~ determined pressure.

Claim 105. (Previously presented) The apparatus as defined in claim 104, wherein the restraint is operable to counterbalance pressure in the capsule generated by

Application No. 09/683,658
Reply to Office Action of March 2, 2006

121655-1

the fluid in response to thermal energy, and the restraint is immobile relative to the capsule while counterbalancing the capsule pressure.

Claim 106. (Previously presented) The apparatus as defined in claim 104, further comprising a heating system that includes the energy source and a temperature sensor, wherein the temperature sensor is disposed proximate to the capsule and is operable to sense a temperature of the capsule.

Claims 107. – 111. (Cancelled)

Claim 112. (Previously presented) The apparatus of claim 104, further comprising a clamp in contact with the restraint, wherein the clamp is operable to reduce a pressure load on at least a portion of the restraint, and the pressure load can cause a longitudinal stress or an axial stress or both a longitudinal and an axial stress on the restraint portion.

Claims 113. – 129. (Cancelled)

Claim 130. (Currently amended) The apparatus as defined in claim 104, wherein the restraint is operable to transmit pressure to the capsule such that the transmitted pressure to the capsule is measurable as a pressure response of the restraint and is less than about 0.2.

Claim 131. – 144. (Cancelled)

Claim 145. (Currently amended) The apparatus as defined in claim 104, further comprising the fluid and the material, and wherein the fluid is sufficiently responsive to

Application No. 09/683,658
Reply to Office Action of March 2, 2006

121655-1

thermal energy to pressurize the capsule to an internal pressure in a range of greater than about 60 kbar, and the capsule and the restraint are cooperatively configured to maintain the seal at the internal pressure and at the corresponding temperature.

Claim 146. (Currently amended) An apparatus, comprising:

a capsule having an interior surface defining a volume, the capsule having disposed within the volume an amount of metal material and an amount of ammonia, the capsule both is sealable to maintain an internal pressure, and is functionally capable of maintaining a seal to the amount of ammonia while the capsule is subject to a ~~predetermined~~ determined temperature and to a pressure in a range of ~~up from about 5~~ kBar to about 80 kBar;

a restraint having an interior surface defining a chamber that is configured to receive the capsule, and the restraint is responsive to resist a pressure exerted by the capsule against the restraint interior surface and to maintain the chamber at about a constant volume, and wherein the restraint is not operable to provide an active pressure load radially inward toward the capsule; and

an energy source operable to supply thermal energy to the capsule, such that the ammonia responds to the thermal energy at the constant volume in the chamber to increase the pressure in the chamber and to become supercritical ammonia, wherein the supercritical ammonia reacts with the metal material to form a metal nitride composition.

Claim 147. (New) The apparatus as defined in claim 146, wherein the metal material comprises aluminum.

Claim 148. (New) The apparatus as defined in claim 147, wherein the restraint is capable of resisting the internal pressure, and the internal pressure is sufficiently high to form aluminum nitride.

Application No. 09/683,658
Reply to Office Action of March 2, 2006

121655-1

Claim 149. (New) The apparatus as defined in claim 148, wherein the restraint is capable of resisting the pressure sufficient to form aluminum nitride at a temperature sufficient to form aluminum nitride.

Claim 150. (New) The apparatus as defined in claim 146, wherein, subsequent to use, the capsule has disposed in the volume the metal nitride composition.

Claim 151. (New) The apparatus as defined in claim 150, wherein the capsule has disposed in the volume a single crystal metal nitride composition.

Claim 152. (New) The apparatus as defined in claim 150, wherein the capsule has disposed in the volume aluminum nitride.

Claim 153. (New) The apparatus as defined in claim 146, wherein the capsule is functionally capable of maintaining the seal to the amount of ammonia while the capsule is subject to the determined temperature and to the pressure in a range of from about 5 kBar to about 60 kBar.

Claim 154. (New) The apparatus as defined in claim 112, wherein the clamp is operable to reduce the pressure load, and the pressure load can cause a longitudinal stress or both a longitudinal and an axial stress on the restraint portion.

Claim 155. (New) The apparatus as defined in claim 104, further comprising the material and the fluid, wherein the material comprises aluminum, and the fluid comprises ammonia.